



Assessment of Knowledge and Practice of Blood Transfusion Among Nurses in a Tertiary Care Hospital in India

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Received: 17 August 2019 / Accepted: 6 December 2019 / Published online: 4 January 2020
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Abstract The purpose of this study was to assess the knowledge and awareness of blood transfusion practices among nurses working in a tertiary care hospital. The objective was to make use of the results to decide the necessity of targeted teaching using lectures and simulated ward scenes. This was a cross sectional study in which a questionnaire comprising of 25 single best-response type multiple choice questions related to blood products and blood transfusion was distributed to nurses who were selected randomly. Questions were both knowledge and practice based. Five hundred and forty-six nurses consented and were assessed. The data was collected, entered and statistically assessed. The number of ‘Correct’, ‘Incorrect’ and ‘Don’t Know’ answers were noted. Each correct answer was awarded 1 point, whereas a wrong answer and a ‘Don’t Know’ answer received no points. The individual scores were noted and then multiplied by 4 to get a percentage value. Nurses with 1–5 years of experience scored statistically better than nurses with < 1 year and > 5 years of experience. Nurses working in the haematology–oncology ward scored the most number of correct responses, followed by nurses working in ICU. Only 9.9% of nurses answered > 80% questions correctly.

Nurses who had 1–5 years of experience scored better. All nurses were trained in blood transfusion at induction. Though there were occasional non-compulsory lectures as ongoing programs, they had no specific impact on knowledge and awareness. The authors suggest that targeted and regular simulated training is essential at all levels of nursing experience.

Keywords Nurses · Blood transfusion · Questionnaire · Awareness · Training

Introduction

The Government of India has issued a guidance document for reporting serious adverse reactions to blood transfusion which includes identification and analysis of reactions and the common errors that lead up to it [1]. While adverse reaction reporting is encouraged, published studies on human errors involved are few. Human errors by blood bank technicians, doctors, and nurses play a major role in adverse reactions related to blood transfusion [1–3]. Nurses, being primary handlers are involved at all steps while transfusing blood, and therefore investing time and energy in their training goes a long way in ensuring a safe patient.

Key elements for errors are poor knowledge, attitude and practice [2]. One of the ways of assessing these key elements is to use a questionnaire. Analysis of the scores from such a questionnaire is expected to lead to a better understanding of what errors are possible, and to plan the best possible way to structure the nurses’ training program and thereby reduce errors.

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Aims and Objectives

This study aimed at assessing the knowledge and awareness of blood transfusion practices among nurses working in a tertiary care hospital. The objective was to make use of the results to decide the frequency and intensity of targeted teaching using lectures and simulated ward scenes.

Methods

After studying other similar questionnaires, we developed our own questionnaire with inputs from a panel of experts on the scientific committee and the nursing director of the hospital and obtained Institutional Ethics Committee clearance [4–6]. This comprised of 25 multiple-choice, ‘single answer correct’ type of questions (1 mark for a correct answer, 0 marks for an incorrect answer or an unattempted question).

Among the 25 questions, 10 questions were related to the theoretical knowledge about blood transfusion (called Transfusion-Knowledge score), and the remaining 15 were related to the actual practice of blood transfusion (called Transfusion-Practice score).

A random sample of 546 consenting nurses working in a tertiary care hospital was taken for the study in July 2018. The nurses were first explained the nature of the questionnaire, its aims and how to answer. Age, gender, place of work, years of experience, and designation were also recorded. Individual scores were noted and then multiplied by 4 to get a percentage value.

Data Collection and Statistical Analysis

The final data was collected and entered in a Microsoft Excel file. Data on categorical variables was shown as n (% of cases) and data on continuous variables was presented as Mean and Standard deviation (SD). Inter-group statistical comparison of categorical variables was done using Chi-Square test. The inter-group statistical comparison of continuous variables was done using independent sample t test (for two groups) and analysis of variance (ANOVA) technique (for more than two groups). The underlying normality assumption was tested before subjecting the study variables to t test and ANOVA.

P values < 0.05 were considered to be statistically significant. All the hypotheses were formulated using two tailed alternatives against each null hypothesis (hypothesis of no difference). The data was statistically analyzed using Statistical Package for Social Sciences (SPSS ver 21.0, IBM Corporation, USA) for MS Windows.

Results

The nurses were allotted to one of 3 groups based on their age: 20–24 years, 25–29 years and > 30 years; while the distribution of mean Transfusion-Knowledge and Total scores did not differ significantly across three age groups (*P* value > 0.05), the mean Transfusion-Practice score was significantly higher in the 20–24 years age group (*P* value < 0.05).

Nurses were allotted to one of 3 groups, based on their years of experience: < 1 year, 1–5 years and > 5 years. Out of 546 nurses, 42.3% of nurses had less than 1 year of experience, 50.9% had between 1 and 5 years and 6.8% had more than 5 years of experience.

The distribution of mean Transfusion-Knowledge and Total scores differed significantly across all durations of experience (*P* value < 0.01), whereas the mean Transfusion-Practice score did not (Table 1).

43% of nurses worked in the general wards, 39.6% in the Intensive Care Unit (ICU) and 17.4% in other wards [operation theatre (OT), haematology and oncology (Haemat–Onco) ward, emergency room (ER), dialysis and diagnostics and out-patient departments]. The distribution of mean Transfusion-Knowledge and Total scores differed significantly across their places of work (*P* value < 0.001), whereas the mean Transfusion-Practice score did not (Table 2).

The scores of nurses working in specific wards, namely haematology and oncology wards (haemat–onco), operation theatre (OT) and emergency room (ER), were further tabulated separately, considering that these places were most likely to deal with blood transfusions in higher frequency. All scores were significantly higher in the haemat–onco group as compared to others (Table 3).

Question no. 10 (What will you monitor during blood transfusion?) was correctly answered by 98.4% nurses, while Question no. 1 (Which blood group is universal donor?) was incorrectly answered by 82.2%. (*P* value < 0.001) (Table 4, Fig. 1).

The total score in percent value was further distributed as low (< 40%), medium (40–59%), good (60–79%) and excellent (\geq 80%). 58.4% nurses had good scores.

Discussion

Among the entire chain of humans involved in the multi-step blood transfusion process, the nurses are the most critical. This is because of their close proximity with the patients. Their knowledge of theory as well as the practical knowledge must be sound in order to ensure patient safety.

Table 1 The distribution of mean scores according to duration of experience (n = 546)

Knowledge scores	Duration of experience (years)						P value
	< 1 year (n = 231)		1–5 years (n = 278)		> 5 years (n = 37)		
	Mean	SD	Mean	SD	Mean	SD	
Transfusion knowledge score	5.27	1.76	5.75	1.88	5.08	2.02	0.006**
Transfusion practice score	10.18	1.73	10.39	1.84	9.59	2.56	0.034*
Total score	15.45	2.87	16.15	3.15	14.68	3.94	0.004**

*, ** P < 0.05 is statistically significant

Table 2 The distribution of mean knowledge scores according to place of work (n = 546)

Knowledge scores	Place of work						P value
	Ward (n = 235)		ICU (n = 216)		Other (n = 95)		
	Mean	SD	Mean	SD	Mean	SD	
Transfusion knowledge score	5.21	1.83	5.87	1.60	5.40	2.29	0.001***
Transfusion practice score	10.25	1.92	10.40	1.57	9.92	2.26	0.104 ^{NS}
Total score	15.46	3.15	16.27	2.52	15.32	4.02	0.007**

, * P < 0.05 is statistically significant

Table 3 The distribution of mean knowledge scores according to specific wards (n = 74)

Knowledge scores	Place of work						P value
	Hemat Onco (n = 20)		OT (n = 40)		ER (n = 14)		
	Mean	SD	Mean	SD	Mean	SD	
Transfusion knowledge score	7.60	1.09	5.15	2.33	4.29	2.55	0.001***
Transfusion practice score	11.25	1.37	9.67	2.56	9.28	1.81	0.014*
Total score	18.85	1.84	14.83	4.35	13.57	3.82	0.001***

*, *** P < 0.05 is statistically significant

Ultimately, their attitude, presence of mind and application of basic knowledge is of utmost importance in patient care.

A PubMed search revealed very few studies similar to ours in India; of those that we found, most had less than 200 respondents [5–9]. No study assessed nurses’ knowledge based on the ward where they worked.

One of the earliest studies on awareness of various aspects of blood donation among health care providers was by Mitra et al. in 2000. They collected responses to a questionnaire from doctors, nurses and other staff. They found that nurses had a relatively poor knowledge about safe practices and blood donation practices as compared to other staff and doctors [5].

When we evaluated the results, the nurses fared better at Transfusion-Practice (66% correct answers) than at Transfusion-Knowledge (54% correct answers), and this pattern was consistent across all age groups. The mean total score was 62% across all age groups. This was similar to the study by Talati et al. [6], where they found that nurses had a mean correct response of 60%. In contrast, a study among 100 nurses in Turkey by Bayraktar et al. showed that only a few nurses had scores higher than 50% [10].

When we correlated the Transfusion-Knowledge and total scores to experience, we found that nurses with 1 to 5 years of experience fared the best, followed by those with less than 1 year of experience. The nurses with more than 5 years of experience fared the worst. These differences were statistically significant (P = 0.006). There was no statistical difference in Transfusion-Practice scores across various experience groups. This suggested that the hands-on experience of the nurses in their first year makes them as safe as more experienced nurses. In contrast, this was not true for theoretical knowledge of blood transfusion. As their experience increased, it appeared that they tended to forget the basics of blood grouping, donation, blood products, collection and handling (some of the concepts tested in the Transfusion-Knowledge section). Perhaps, experienced nurses are more involved in administration and supervision and are likely to forget the fundamentals. This was in contrast to the study by Talati et al. [6] where they found that seniority did not affect the scores of the nurses. Bayraktar and Erdil [10] found that there was a statistically significant relation between the experience and knowledge scores, but not between the experience and

Table 4 The distribution of accuracy of answers to all questions (n = 546)

No	Questions	Correct		Incorrect		Don't know		Total	
		n	%	n	%	n	%	n	%
Q1	Which blood group is universal donor?	94	17.2	449	82.2	3	0.5	546	100.0
Q2	How often can a person donate blood?	462	84.6	57	10.4	27	4.9	546	100.0
Q3	How long can RBCs be stored after collection?	161	29.5	297	54.4	88	16.1	546	100.0
Q4	At what temp are the RBCs stored in blood bank?	258	47.3	220	40.3	68	12.5	546	100.0
Q5	What are the instructions given to the patients before starting the blood transfusion?	350	64.1	185	33.9	11	2.0	546	100.0
Q6	What diseases can be transferred through blood transfusion?	344	63.0	173	31.7	29	5.3	546	100.0
Q7	What will you check before starting blood transfusion?	517	94.7	28	5.1	1	0.2	546	100.0
Q8	Which is the most common cause of blood transfusion reactions?	400	73.3	94	17.2	52	9.5	546	100.0
Q9	What precautions will you take for yourself before starting transfusion?	434	79.5	110	20.1	2	0.4	546	100.0
Q10	What will you monitor during blood transfusion?	537	98.4	5	0.9	4	0.7	546	100.0
Q11	How often do you monitor the patient?	158	28.9	380	69.6	8	1.5	546	100.0
Q12	During blood transfusion should the patient be within your eyesight at all times?	443	81.1	69	12.6	34	6.2	546	100.0
Q13	How soon should the blood be given to the patient after issue?	351	64.3	165	30.2	30	5.5	546	100.0
Q14	Can you refrigerate the blood bag again after it is issued, if there is a delay in administration?	119	21.8	372	68.1	55	10.1	546	100.0
Q15	How fast can you transfuse blood to the patient?	402	73.6	106	19.4	38	7.0	546	100.0
Q16	How is the blood treated before transfusing to patients on chemotherapy	181	33.2	174	31.9	191	35.0	546	100.0
Q17	Can we transfuse blood to HIV positive patient?	365	66.8	139	25.5	42	7.7	546	100.0
Q18	What will you do if the patient shows signs of fever and chills?	534	97.8	7	1.3	5	0.9	546	100.0
Q19	You notice that 2hrs after transfusing of properly matched blood, the patient starts having tachycardia, hypotension and dyspnea. What is the first thing you will do?	513	94.0	20	3.7	13	2.4	546	100.0
Q20	Human error is the commonest cause of mismatched blood transfusion. What can be the most probable reason?	378	69.2	158	28.9	10	1.8	546	100.0
Q21	Is there a need for informed consent before blood transfusion?	534	97.8	8	1.5	4	0.7	546	100.0
Q22	What is the final step to ensure ABO compatibility?	361	66.1	161	29.5	24	4.4	546	100.0
Q23	If there was a cloudy/foamy appearance in the blood bag, what should you do?	415	76.0	87	15.9	44	8.1	546	100.0
Q24	While hooking the blood bag, if you accidentally double punctures the blood bag and it starts leaking, what is the right thing to do?	137	25.1	317	58.1	92	16.8	546	100.0
Q25	About an hour after beginning properly matched blood transfusion, you observe that the patients shows signs of itching and rashes. This patient has no fever, has tachycardia, blood pressure is normal, and has normal coloured urine. How will you treat this patient?	153	28.0	309	56.6	84	15.4	546	100.0

practice scores. Encan and Akin [11] concluded from their study that new graduates or inexperienced nurses, those working in medical units, and those who did not often implement blood transfusions needed more support to improve their knowledge levels ($P < 0.05$). In stark contrast, Rao et al. [7] found that 100% of the nurses (132 nurses with 1–3 years of experience) had adequate working knowledge of transfusion reactions and 93.2% could deal with such untoward incidences. Their questionnaire had 11 questions for which descriptive answers had to be written.

In our study, the nurses who worked in the ICU had a significantly higher Transfusion-Knowledge and Total scores ($P < 0.001$ and < 0.007 respectively) than their

counterparts in the wards, OT, ER etc. We found that the Haemat–Oncology ward nurses fared significantly better in Knowledge, Practice and Total scores followed by the OT and the ER nurses ($P < 0.05$). Nurses working in the Haemat–Oncology ward deal with blood and blood product transfusion at a much greater frequency than any other ward. It is but logical and reassuring, that the nurses working in these wards have a better score in theoretical and practical aspects than those nurses that work in other wards including the ICU. The OT and ER are both places where the doctors are most likely to be present at point of care, along with the nurses and there is a lot of close supervision. A high doctor–patient ratio in the OT/ER,

Distribution of Accuracy of Answers To All Questions

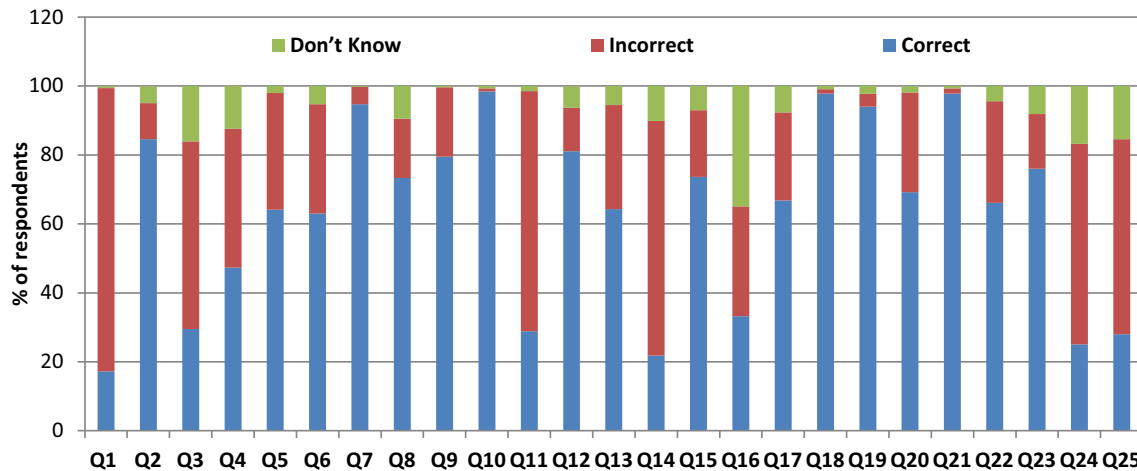


Fig. 1 The distribution of accuracy of answers to all questions (n = 546)

Table 5 The distribution of respondents according to overall scores/level of knowledge

Marks obtained (%)	Score/level of knowledge	No. of respondents	% of respondents
< 40	Low	20	3.7
40–59	Medium	153	28.0
60–79	Good	319	58.4
≥ 80	Excellent	54	9.9
Total		546	100.0

where the doctors order, check and handle blood products very actively may preclude nurses from acting independently. This may actually make the nurses less likely to retain/recall their knowledge and more likely to just follow instructions without applying their mind.

The question which was answered correctly by maximum number of nurses (98.4%) was “What will you monitor during transfusion of blood?”, which checked their practical knowledge. Surprisingly, the question which got most incorrect answers (82.2%) was “Which blood group is a universal donor?”, which tested their theoretical knowledge. This was quite surprising as many nurses were not aware of the concept of the Rh antigen. This was in contrast to Talati et al.’s study where they found that nurses scored nearly 70% on questions related to blood grouping and Rh antigens [6]. The question which maximum number of nurses left un-attempted (35%) was “How is blood treated before transfusing to patients on chemotherapy?”, which tested their theoretical understanding.

Staff training has become an integral part of any successful hospital transfusion program. Kaur et al. [8] showed that there was a 34.4% improvement in pre-training and post-training scores among MBBS doctors with regard to blood transfusion practices and knowledge. This is likely to hold true for nurses as well. To keep their knowledge

refreshed, intensive, targeted and repetitive training should be implemented. Smith et al. [12] suggested a 6-monthly practical-oriented training program to prevent degradation of knowledge over a period of time. Focused training of nurses who work in departments where blood transfusion is carried out regularly including Hematology–Oncology ward, ER, ICU and OT must be done on a regular basis.

Conclusion

Repeated and focused training of nurses is very important to enable retention of critical principles as well as keeping them updated on new, efficient practices. We propose that the nursing director of every hospital, along with the blood bank director and haematologist/ transfusion medicine specialist should draw up a training program. They should decide what extent of knowledge among nurses is acceptable, and should hold an induction training of at least 2 h for the newly joining nurses. This should further be followed up with refresher training every 6 months. There should be a pre-training test of 15 min, followed by a 30-min lecture. Following a 15-min interaction, a 45-min simulation of various ward scenes including transfusion reactions should be done which is supervised by a

haematologist or transfusion medicine specialist. This should then be followed by a 15-min post-training test of the same set of questions. The nurses should then be informed of their scores both pre-and post-training. Scores of more than 90% (correct) should be targeted.

Compliance with ethical standards

Conflict of interest None.

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